WHAT IS CLAIMED IS:

1. An isolated nucleic acid molecule of an alternative splicing variant of a human T-type calcium channel subunit, comprising a sequence of nucleotides encoding a T-type calcium channel α_{1I-1} subunit selected from the group consisting of:

(a) a sequence of nucleotides that encodes a human T-type calcium channel α_{1I-1} subunit and comprises the sequence of nucleotides set forth in one of SEQ ID NO:18;

(b) a sequence of nucleotides having at least 95% sequence identity or is exactly complementary to the nucleotide sequence set forth in SEQ ID NO:18,

(c) a nucleotide sequence varying from the nucleotide sequence specified in (a) or (b) as a result of degeneracy of the genetic code;

(d) biologically active fragments of (a), (b), or (c), that encodes polypeptide capable of forming a functional T-type calcium channel.

2. A substantially pure polypeptide comprising an amino acid sequence selected from the group consisting of: (i) an amino acid sequence coded by the isolated nucleic acid molecule of claim 1; (ii) homologues of the amino acid sequences of (i) in which one or more amino acids has been added, deleted, replaced or chemically modified in the region, or adjacent to the region, where the amino acid sequences differs from the original amino acid sequence, coded by the original α_{1I-1} nucleic acid sequence from which the variant has been varied by alternative splicing.

3. A substantially pure polypeptide comprising an amino acid sequence encoded by the nucleotide sequence as set forth in one of SEQ ID NOS:18 or 20.

4. A substantially pure polypeptide comprising an amino acid sequence as set forth in one of SEQ ID NOS:19 or 21.

5. A substantially pure polypeptide which has at least 80 % identity to the amino acid sequence of SEQ ID NO:19, which may include up to N_a amino acid alterations over the entire length of SEQ ID NO:19, wherein N_a is the maximum number of amino acid alterations, and is calculated by the formula

$N_a = X_a - (X_a Y)$,

in which X_a is the total number of amino acids in SEQ ID NO:19, and Y has a value of 0.80, wherein any non-integer product of X_a and Y is rounded down to the nearest integer prior to subtracting such product from X_a.

6. A purified antibody which binds to an amino acid sequence which is present only in a variant protein comprising the amino acid sequence set forth in one of SEQ ID NOS:19 or 21, but is not present in the amino sequence of a wild type α_{1I} polypeptide .

7. An expression vector comprising the nucleic acid molecule of claim 1 operably linked to a regulatory nucleotide sequence that controls expression of the nucleic acid molecule in a suitable host cell.

8. A recombinant host cell transfected by the expression vector of claim 8.

9. The cell of claim 8 which is also transformed with DNA expression vectors encoding additional calcium channel subunits necessary and sufficient for assembly of a functional voltage-gated calcium channel.

10. A pharmaceutical composition comprising a pharmaceutically acceptable carrier and as an active ingredient an agent selected from the group consisting of: (i) the expression vector of claim 8; and (ii) the polypeptide of claim 3 or 4.

11. A method for detecting the presence of a variant nucleic acid sequence of α_{1I-1} in a biological sample, comprising the steps of: (a) hybridizing to nucleic acid material in said biological sample nucleic acid molecule of claim 1 under conditions favoring the formation of a hybridization complex; and (b) detecting said hybridization complex; wherein the presence of said hybridization complex correlates with the presence of an variant nucleic acid sequence in the said biological sample.

12. A method for determining the level of variant nucleic acid sequences of α_{1I-1} in a biological sample comprising the steps of: (a) hybridizing to nucleic acid material of said biological sample the nucleic acid sequences of claim 1; and (b) determining the amount of hybridization complexes and normalizing said amount to provide the level of the variant nucleic acid sequences in the sample.

13. A method for determining the ratio between the level of the nucleic acid sequence of an α_{1I-1} variant in a first biological sample and the level of the reference α_{1I-1} sequence, GenBank accession # AF211189 from which the variant has been varied by single nucleotide polymorphism, in a second biological sample comprising: (a) determining the level of the α_{1I-1} variant nucleic acid sequence in the first biological sample according to the method of claim 13; (b) determining the level of the α_{1I-1} reference sequence in the second biological sample; and (c) comprising the levels obtained in (a) and (b) to give said ratio.

14. A method according to claim 13, wherein said first and said second biological samples are the same sample.

15. An isolated nucleic acid molecule of an alternative splicing variant of a human T-type calcium channel subunit, comprising a sequence of nucleotides encoding a T-type calcium channel α_{1I-2} subunit selected from the group consisting of:

(a) a sequence of nucleotides that encodes a human T-type calcium channel α_{1I-1} subunit and comprises the sequence of nucleotides set forth in one of SEQ ID NO:20;

(b) a sequence of nucleotides having at least 95% sequence identity or is exactly complementary to the nucleotide sequence set forth in SEQ ID NO:20,

(c) a nucleotide sequence varying from the nucleotide sequence specified in (a) or (b) as a result of degeneracy of the genetic code;

(d) biologically active fragments of (a), (b), or (c), that encodes polypeptide capable of forming a functional T-type calcium channel.

16. A method for identifying candidate compounds capable of binding to the variant product and modulating its activity the method comprising: (i) contacting a candidate compound with the substantially pure polypeptide of claim 3; and (ii) determining the effect of said candidate compound on the biological activity of said protein or polypeptide and selecting those compounds which show a significant effect on said biological activity.

17. A method according to claim 16, wherein the compound is an agonist and the measured effect is increase in the biological activity.

18. A method according to claim 17, wherein the compound is an antagonist and the effect is decrease in the biological activity.

19. A method for detecting an α_{1I} isoform in a first biological sample, comprising the steps of: (a) contacting a detectable probe with said biological sample suspected of containing said variant under conditions favoring the formation of a complex between said probe and any said variant; and (b) detecting said complex wherein the presence of said complex correlates with the presence of the desired amino acid in said biological sample.

20. The method according to claim 19, wherein said probe is an antibody.

21. The method according to claim 19, wherein said probe is an immunologically active polypeptide specific for said isoform.

22. A method for detecting the level of the polypeptide variant of SEQ ID NO:19 or 21 or a fragment thereof in a biological sample, comprising the steps of: (a) contacting with said biological sample with a detectable antibody having binding specificity for said polypeptide variant of SEQ ID NO:19 or 21, thereby forming an antibody-polypeptide complex; and (b) detecting the amount of said antibody-polypeptide complex and normalizing said amount to provide the level of said amino acid sequence in the sample.

23. An agent which selectively binds the human T-type calcium channel designated α_{1I}-1 or α_{1I}-2 subunit polypeptide or a nucleic acid that encodes said polypeptide.

24. The agent of claim 23, wherein the agent is a polypeptide which binds selectively to one or both of said human T-type calcium channel α_{1I} isoform polypeptide.

25. The agent of claim 24, wherein the polypeptide is a monoclonal antibody or a polyclonal antibody.

26. The agent of claim 24, wherein the polypeptide is an antibody fragment selected from the group consisting of a Fab fragment, a $F(ab)_2$ fragment and a fragment including a CDR3 region.

27. The agent of claim 23, wherein the agent is an antisense nucleic acid which selectively binds to a nucleic acid encoding said human T-type calcium channel α_{1I} isoform polypeptide.

28. A method for following progress of a therapeutic regimé designed to alleviate a condition characterized by aberrant expression of a gene product expressed from the isolated nucleic acid molecule of claim 1 or 15, comprising:

(a) assaying a sample from a subject to determine level of a parameter selected from the group consisting of (i) a polypeptide encoded by a the nucleotide sequence of SEQ ID NO:18 and (ii) a polypeptide encoded by the nucleotide sequence of SEQ ID NO:20, at a first time point;

(b) assaying level of the parameter selected in (a) at a second time point and

(c) comparing said level at said second time point to the level determined in (a) as a determination of effect of said therapeutic regimé.

29. A method for inhibiting human T-type calcium channel α_{1I-1} or α_{1I-2} subunit activity in a mammalian cell comprising contacting the mammalian cell with an amount of a human T-type calcium channel α_{1I-1} or α_{1I-2} subunit inhibitor effective to inhibit calcium influx in the mammalian cell.

30. The method of claim 30, wherein the inhibitor is selected from the group consisting of an antibody which selectively binds one of a human T-type calcium channel α_{1I-1} or α_{1I-2} subunit polypeptide, an antisense nucleic acid which binds a nucleic acid encoding one of a human T-type calcium channel α_{1I-1} or an α_{1I-2} subunit polypeptide and a dominant negative human T-type calcium channel α_{1I-1} subunit polypeptide.

31. A method for treating a subject having a stroke, epileptic seizure, or traumatic brain injury comprising administering to a subject in need of such treatment an inhibitor of the human T-type calcium channel α_{1I-1} subunit polypeptide in an amount effective to inhibit voltage regulated calcium influx.

32. The method of claim 32, wherein the inhibitor is selected from the group consisting of an antibody which selectively binds the human T-type calcium channel α_{1I-1} subunit polypeptide, an antisense nucleic acid which binds a nucleic acid encoding human T-type calcium channel α_{1I-1} or an α_{1I-2} subunit polypeptide and a dominant negative human T-type calcium channel α_{1I-1} or an α_{1I-2} subunit polypeptide.

33. A method for increasing human T-type calcium channel α_{1I-1} subunit expression in a cell comprising contacting the cell with a molecule selected from the group

consisting of a human T-type calcium channel α_{1I-1} subunit nucleic acid and a human T-type calcium channel α_{1I-1} subunit polypeptide, in an amount effective to increase voltage regulated calcium influx in the cell.

34. A method for increasing human T-type calcium channel α_{1I-2} subunit expression in a cell comprising contacting the cell with a molecule selected from the group consisting of a human T-type calcium channel α_{1I-2} subunit nucleic acid and a human T-type calcium channel α_{1I-2} subunit polypeptide, in an amount effective to increase voltage regulated calcium influx in the cell.

35. The method of claim 33 or 34, wherein the cell is contacted with one or more human T-type calcium channel nonα_{1I-1} or nonα_{1I-2} subunits of the human T-type calcium channel or nucleic acid molecules encoding such subunits.

36. A method for identifying lead compounds for a pharmacological agent useful in the treatment of disease associated with increased or decreased voltage regulated calcium influx mediated by a human T-type calcium channel comprising:

(i) providing a cell expressing a human T-type calcium channel isoform subunit polypeptide designated herein as α_{1I-1} or α_{1I-2};

(ii) contacting the cell with a candidate pharmacological agent under conditions which, in the absence of the candidate pharmacological agent, to thereby cause a first amount of voltage regulated calcium influx into the cell; and

(iii) determining a test amount of voltage regulated calcium influx as a measure of the effect of the lead compounds for a pharmacological agent on the voltage regulated calcium influx mediated by a human T-type calcium channel, wherein (a) the test amount of voltage regulated calcium influx which is less than the first amount indicates that the candidate pharmacological agent is a lead compound for a pharmacological agent which reduces voltage regulated calcium influx and (b) wherein a test amount of voltage regulated calcium influx which is greater than the first amount indicates that the candidate pharmacological agent is a lead compound for a pharmacological agent which increases voltage regulated calcium influx.

37. The method of claim 36, further comprising loading said cell with a calcium-sensitive dye which is detectable in the presence of calcium, wherein the calcium-sensitive dye is detected as a measure of the voltage regulated calcium influx.

38. A method for identifying compounds which selectively bind a human T-type calcium channel α_{1I-1} subunit isoform comprising, (i) providing a test cell preparation, wherein said cell expresses a human T-type calcium channel α_{1I-1} subunit isoform, (ii) providing a control cell preparation, wherein said cell expresses a human T-type calcium channel non-α_{1I-1} subunit isoform, with the proviso that the cell in the cell preparation is identical to the test cell except for the expression of a non-α_{1I-1} isoform being expressed, (iii) contacting the test cell preparation and the control cell preparation with a compound, and (iv) determining the binding of the compound to the test cell preparation and the control cell preparation, wherein a compound which binds the test cell preparation but does not bind the control cell preparation is a compound which selectively binds the human T-type calcium channel α_{1I-1} subunit isoform.

39. A diagnostic method for treating or correcting a disease state caused by a dysfunctional human T-type calcium channel mediated by an α_{1I} isoform polypeptide, predicting an oncogenic potential of a sample of lung and colon cells, comprising:

(a) providing a sample of human lung or colon tissue; and

(b) determining, in the sample, levels of expression of a gene product expressed from a nucleotide sequence as set forth in SEQ ID NOS:18 or 20 or a nucleotide sequence which hybridizes to the nucleotide sequence corresponding to SEQ ID NO:18 or 20 or its complement, wherein an aberrant levels of said gene product relative to normal indicates the need for treatment.

40. A diagnostic method for predicting an oncogenic potential of a sample of cells, comprising:

(a) determining, in the sample, levels of expression of a gene product expressed from a nucleotide sequence of SEQ ID NO:18 or 20 or a sequence which hybridizes to one of the above sequences or its complement, wherein excessive or insufficient levels of expression of said gene product relative to normal is predictive of the oncogenic potential of said cells.

41. The nucleic acid molecule of claim 1 or 15, wherein said nucleic acid molecule is cDNA.

42. Recombinant messenger RNA complementary to the cDNA of claim 41.

43. An isolated antibody which specifically binds to a polypeptide comprising an amino acid sequence selected from the group consisting of:

(a) an amino acid sequence of SEQ ID NOS:19 or 21,

(b) a naturally-occurring amino acid sequence having at least 95% sequence identity to the sequence of SEQ ID NOS:18 or 20, wherein said naturally-occurring amino acid sequence has the ability to regulate voltage gated calcium influx under physiological conditions and

(c) an immunogenic fragment derived from one of SEQ ID NO:19 or 21.

44. A method for identifying compounds which selectively bind a human T-type calcium channel α_{1I-2} subunit isoform comprising, (i) providing a test cell preparation, wherein said cell expresses a human T-type calcium channel α_{1I-2} subunit isoform, (ii) providing a control cell preparation, wherein said cell expresses a human T-type calcium channel non-α_{1I-1} subunit isoform, with the proviso that the cell in the cell preparation is identical to the test cell except for the expression of a non-α_{1I-2} isoform being expressed, (iii) contacting the test cell preparation and the control cell preparation with a compound, and (iv) determining the binding of the compound to the test cell preparation and the control cell preparation, wherein a compound which binds the test cell preparation but does not bind the control cell preparation is a compound which selectively binds the human T-type calcium channel α_{1I-1} subunit isoform.

45. A recombinant human cell line which has been engineered to express a heterologous protein, the cell line comprising at least one host cell transformed or transfected with a heterologous nucleic acid molecule of one of claim 1 or 15 that expressed an α_{1I} isoform polypeptide.

46. A method for producing a subunit of a human calcium channel, comprising introducing the nucleic acid molecule of claim 15 into a eukaryotic host cell, under conditions whereby the encoded subunit is expressed.

47. A method of producing the recombinant protein, according to claim 3 or 4, comprising:

(a) inserting the nucleic acid sequence as set forth in SEQ ID NO:18 or a fragment or variant thereof into an expression vector;

(b) transferring the expression vector into a host cell; or transfecting or transforming a host cell with the expression vector of step (a) above;

(c) culturing the host organism under conditions appropriate for amplification of the vector and expression of the protein; and

(d) harvesting the recombinant protein from the culture.

48. A method for identifying compounds that modulate the activity of T-type calcium channel α_{1I} subunit, the method comprising:

comparing the difference in the amount of transcription of a reporter gene in a cell in the presence of the compound with the amount of transcription in the absence of the compound, or with the amount of transcription in the absence of a heterologous T-type calcium channel α_{1I} subunit , whereby compounds that modulate the activity of the heterologous calcium channel subunit in the cell are identified, wherein the cell comprises a nucleic acid molecule that encodes a reporter gene construct containing a reporter gene in operative linkage with one or more transcription control elements that is regulated by a calcium channel and furthermore the cell is a eukaryotic cell transfected with a nucleic acid molecule comprising the coding portion of the sequence of nucleotides set forth in one of SEQ ID NO: 18 or 20.

49. A method for identifying a test compound capable of modulating the activity of T-type calcium channel α_{1I} subunit, the method comprising :

(i) suspending a eukaryotic cell in a solution containing the compound and a calcium channel selective ion;

(ii) depolarizing the cell membrane of the cell, and

(iii) detecting the current or ions flowing into the cell,

wherein the eukaryotic cell comprises a functional calcium channel that contains at least one subunit encoded by a heterologous nucleic acid comprising the coding portion of the sequence of nucleotides set forth in SEQ ID NOs: 18 or 20, and

wherein the current that is detected is different from that produced by depolarizing the same or a substantially identical cell in the presence of the same calcium channel selective ion but in the absence of the test compound.

50. The method of claim 49, wherein prior to the depolarization step the cell is maintained at a holding potential which substantially inactivates calcium channels that are endogenous to the cell.